Patent # ________________

TITLE **Particle Accelerator Space Engine**

John P. Foster, St. Augustine, Florida, 32095

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2 claims

~~**Cross Reference to Related Applications** - This invention pertains to a propulsion device~~ employing particle accelerator accelerator / storage ring / braking device technology to provide novel method and mechanism for vertical propulsion, referred to as "Gyroscopic Lift". The invention also utilizes particle accelerator / storage ring / braking device in secondary method for horizontal propulsion relative to the ship, referred to as "Impulse Propulsion".

Federal Status of Funding -The invention described herein is not a Federally funded research and development project.

Background of Invention - The invention utilizes principle operations of three types of particle stream technology in a new and novel application. Those technologies are particle accelerators, storage rings, and braking devices. The particle accelerator / storage ring / braking device shall heretofor be referred to as Particle Accelerator Space Engine. Particle accelerators have been designed for bombardment of particles such as to start a nuclear chain reaction, or create new man made elements, or study anti-matter. Storage rings have been designed for the purpose of circulating matter at a fixed high velocity so as to store kinetic energy associated with moving particles. Braking devices employ reverse technology of particle accelerators, to enable particles in a particle stream to be slowed down.

Brief Summary of the Invention- This invention seeks to utilize particle accelerator/ storage ring/ braking device technology in a new and novel applications concerning methods of

propulsion. The Particle Accelerator Space Engine is mobile, allowing particle motion to cause reactive motion to the engine, and vice versa. Mathematical trajectories presented here depict how particle motion drives the engine through space.

Brief description of drawings - Figures 1 through 9 are designed to show the methodology and mathematics for vertical propulsion, referred to as a new principle of aerospace physics called "Gyroscopic Lift". Figure 1 represents a typical placement for two counter-circulatory particle accelerator doughnuts. Figure 2 represents circulatory path for particles found in one of the doughnuts of the Particle Accelerator Space Engine, and a directional analysis of velocity vectors for 4 theoretic point particles as related to the earth. Figure 3 represents a directional analysis of radial acceleration relative to the earth for a typical point particle at an instantaneous moment in time. Figure 4 represents a particle trajectory for an individual particle as the particle moves through time and space. Figure 5 represents a directional analysis of radial acceleration as a cumulative effect for the sum of all theoretic point particles in the circulatory path. Figure 6 is a pair of two dimensional graphs depicting all of the accelerative influences exerted upon point particles on two respective geometric planes. Figure 7 is a mathematical formula for determining acceleration, and thrust related to vertical propulsion. Figure 8 is an example of the formula for thrust found in figure 7. Figure 9 is a mathematic theoretic example for determining a ships vertical acceleration rate. Figures 10 through 12 are a series depicting the methodology and mathematics for a horizontal propulsion, referred to as a new principle of aerospace physics called "Impulse Propulsion". Figure 10 is a depiction of centripetal acceleration in radial coordinates for alternating accelerative/ decelerative ½ cycles. Figure 11 is a depiction for change in centripetal acceleration in Cartesian

coordinates for alternating accelerative/ decelerative ½ cycles. Figure 12 is a particle trajectory for an individual particle as it moves through time and space.

Detailed description - Referring now to the drawings; particle accelerator Space Engine is composed of two circular particle accelerator/ storage ring/ braking devices , mounted one above the other, with particle streams traveling in counter-rotational directions, as depicted in figure 1. Each of these devices may produce horizontal and / or vertical propulsion. The configuration is for the purpose of stabilizing cabin motion, and complimenting counter-rotational particle motions. Both clockwise, and counterclockwise particle accelerators produce upward thrust, but are capable of providing each other with equal but opposite recoil acceleration, to prevent the cabin from rotating. The determination of function at a given time as a particle accelerator, storage ring, or braking device is regulated by particle stream velocity at a given time. The ability to kick a particle to a higher, stable, or lower velocity is regulated by timing and intensity of particle accelerator station kicks, and magnetic forces located about the circumference of the doughnuts. Although these technologies are common practice to the field of particle accelerators, they are not always categorized as such. Mention is made to include the fields of storage rings and braking devices. Figure 2 is a representation of one of the circular particle accelerators with particles traveling counterclockwise. Particles are circulated in the device at velocities above circular orbit velocity for relative altitude of the planet. For mathematical purposes, symmetry can be used to treat the mass of the particle stream as if it were equally distributed to points that intersect the xz and yz planes, at an instantaneous moment in time. These theoretic point particles are labeled H, I, J and K. Figure 2 also depicts the directional component of velocity for each point particle perpendicular to gravity. Figure 3 is a typical representation depicting how the instantaneous component of velocity for a point

particle interacts with the earth's gravity to provide radial acceleration relative to the planet. Mathematically, radial acceleration is computed as v^2/r, with r representing the radius to the planet center. In all scientific examples, objects that travel perpendicular to gravity above circular orbit velocity continue on, to gain altitude as time progresses. In such state, the particle may be regarded as sidestepping gravity, at a faster rate than falling. Typically, an object that has velocity perpendicular to gravity between circular orbit velocity and escape velocity enters the ascending side of an elliptic orbit..; At escape velocity, an object enters the ascending side of a parabolic obit, and above escape velocity an object enters the ascending side of a hyperbolic orbit. Unless other perturbing forces are present, to throw the object off track, it always gains altitude. In the Particle Accelerator Space Engine, the magnitude of velocity for the particle stream is much greater than escape velocity. The effect of an ascending hyperbolic orbit with a centripetal perterbation towards the center axis of the Particle Accelerator Space Engine creates an ascending helical trajectory. Figure 4 is a depiction of an ascending helical trajectory for an individual point particle as it moves through 3 dimensional space. The upward spiraling trajectory of the point particle is contained by electromagnetic forces within the Particle Accelerator Space Engine, but the forces exerted by the particle stream, onto the engine, create lift for the entire device and aerospace craft. Figure 5 is a 3 dimensional depiction of all the theoretic point particles, and the instantaneous acceleration vectors of gravity, centripetal acceleration relative to the center of the accelerator, and radial acceleration relative to the planet. Figure 6 is a pair of two dimensional graphs representing the xz plane and yz planes. All of the acceleration vectors depicted in figure 5 are trancribed to figure 6, such that trigonometric relations can be easily seen. The trigonomic triangles enable the vectors to be broken down to component vectors for their respective axis. Point particle H is traveling

perpendicular to the page outward. Point particle J is traveling perpendicular to the page inward. Point particle K is traveling perpendicular to the page outward. Point particle I is traveling perpendicular to the page inward. Sample of initialing:

$a_{(rxH)}$ = radial acceleration component, to earth center relative to x axis for particle H.

$a_{(rzH)}$ = radial acceleration component, to earth center relative to z axis for particle H.

$a_{(cxH)}$ = centripetal acceleration component, to ring center relative to x axis for particle H.

$a_{(czH)}$ = centripetal acceleration component, to ring center relative to z axis for particle H

$a_{(gxH)}$ = gravity acceleration component, to earth center relative to x axis for particle H.

$a_{(gzH)}$ = gravity acceleration component, to earth center relative to z axis for particle H.

$a_{(rxJ)}$ = radial acceleration component, to earth center relative to x axis for particle J.

$a_{(rzJ)}$ = radial acceleration component, to earth center relative to z axis for particle J.

$a_{(cxJ)}$ = centripetal acceleration component, to ring center relative to x axis for particle J.

$a_{(czJ)}$ = centripetal acceleration component, to ring center relative to z axis for particle J

$a_{(gxJ)}$ = gravity acceleration component, to earth center relative to x axis for particle J.

$a_{(gzJ)}$ = gravity acceleration component, to earth center relative to z axis for particle J.

$a_{(ryK)}$ = radial acceleration component, to earth center relative to y axis for particle K.

$a_{(rzK)}$ = radial acceleration component, to earth center relative to z axis for particle K.

$a_{(cyK)}$ = centripetal acceleration component, to ring center relative to y axis for particle K.

$a_{(czK)}$ = centripetal acceleration component, to ring center relative to z axis for particle K

$a_{(gyK)}$ = gravity acceleration component, to earth center relative to y axis for particle K.

$a_{(gzK)}$ = gravity acceleration component, to earth center relative to z axis for particle K.

$a_{(ryI)}$ = radial acceleration component, to earth center relative to y axis for particle I.

$a_{(rzI)}$ = radial acceleration component, to earth center relative to z axis for particle I.

$a_{(cyI)}$ = centripetal acceleration component, to ring center relative to y axis for particle I.

$a_{(czI)}$ = centripetal acceleration component, to ring center relative to z axis for particle I

$a_{(gyI)}$ = gravity acceleration component, to earth center relative to y axis for particle I.

$a_{(gzI)}$ = gravity acceleration component, to earth center relative to z axis for particle I.

Figure 7 is a mathematical formula for determining gyroscopic lift. It sums the component vectors of acceleration in a manner that reveals an equation for instantaneous thrust, and instantaneous acceleration in the z direction. To describe the mathematical process: An initial equation is generated for Force exerted by each of the 4 theoretic point particles. Each particle is assigned ¼ of the mass of the particle stream which is multiplied by the cumulative accelerations exerted on or by the particle. The four point particle equations are written one above another so as to form columns for summation. Although the hypotenuse' for the 4 theoretic point particles may differ in direction, their magnitudes are equal, and their component vectors either compliment one another or oppose one another. When all of the acceleration vectors are broken down into vector components then summed, the result causes many vector components to cancel each other out, leaving only acceleration in the z direction, referred to as $a_{(z)}$. The mathematical formula for vertical acceleration is : $\mathbf{a_{(z)} \approx v^2/r + a_g}$. The mathematical formula for vertical thrust is : $\mathbf{m_{particle\ stream} a_{(z)}} = \mathbf{thrust}$.

Figure 8 is a mathematical model presented for the purpose of demonstrating use of the equations for vertical thrust. In the upper equation an amount of thrust is calculated for 50 milligrams of ionized particles traveling at 60% velocity of light in one of the particle accelerator rings. The particle stream may be brought to a constant velocity, similar to a storage ring, but with the intent of harnessing upward thrust. For an individual ring, this example produces 2.54×10^5 Newtons of thrust. Although specific values are used for mass, velocity,

and thrust, the equations are not limited to these values, nor is it required that the velocity of the particle stream be constant, in order that upward thrust be developed. Many combinations of particle stream velocity, and mass are possible, such that varying these configurations while in flight allows the craft to navigate altitude. Figure 9 is a mathematical model for the purpose of demonstrating use of equations derived in figure 8. If the vehicle is fitted with two particle accelerators, with particle flow in counter-rotational directions, it would double the upward thrust. This should enable 40 metric tons to be lifted upward at an acceleration rate of 2.9 m/s^2. The equation adds upward force, that is generated through gyroscopic lift of the particles, with downward force of gravity as applied to the deadweight of the ship, to determine the overall force with which the craft should move. With particle velocity of .6c, a vehicle , such as a commercial passenger vehicle, fitted with a circular Particle Accelerator Space Engine around the perimeter, and deadweight of approximately 40 metric tons would be capable of vertical acceleration at about .3 g's. In the vacuum of outer space it has the potential to develop a very high top velocity. Once a desired altitude is found, it may be stabilized by adjusting the particle stream velocity such that upward thrust that is generated matches the the force of gravity. Any velocity of circulatory matter exceeding circular orbit velocity may be utilized to harness upward acceleration and/ or thrust. Thus many combinations of matter quantity, and velocity may be combined to create and /or navigate using such a propulsion engine.

Figures 10 through 12 are a series depicting the methodology for horizontal propulsion, referred to as "Impulse Propulsion". Figure 10 is a depiction of the centripetal acceleration pattern for a particle that accelerates during a half cycle, and decelerates during the other half cycle. Particles, beginning at point A, must increase centripetal acceleration when passing through each successive point to keep on a circular path, until reaching point F. At point F

particles start a decelerative ½ cycle. Each successive point requires less centripetal acceleration to maintain the circular path. Equal particle speeds are located at B&J, C&I, D&H, E&G

Figure 11 is a depiction of change in acceleration in Cartesian Coordinates. The change in acceleration is both a change per time, and a change per angle. It must be computed individually for each point about the circumference of the particle stream. In Cartesian coordinates, y components cancel, when summed, and a directional component may be found to cause motion along the x axis. Y components, for change in acceleration, during the accelerative ½ cycle, have symmetric, equal but opposite, counterparts in the decelerative ½ cycle. As such, particles at B_y provide equal but opposite force along the y axis to particles at J_y. Particles at C_y provide equal but opposite force along the y axis to particles at I_y. Particles at D_y provide equal but opposite force along the y axis to particles at H_y. Particles at E_y provide equal but opposite force along the y axis to particles at G_y. This symmetric relation eliminates recoil acceleration of the ship in the y direction.

When the y component of acceleration is eliminated it leaves only the x component of particle acceleration. As particles are accelerated through stations in one direction, the accelerator station and ship are accelerated in the opposite direction. During the first ½ cycle, particles are accelerated in the negative x direction. The hull of the ship responds by accelerating in the positive x direction. During the remaining decelerative ½ cycle, a series of repulsive forces are placed downstream. Change in particle acceleration is again measured in the negative x direction. Particles approaching the repulsive force push the ship in the positive x direction. At points A and F, particles are neither accelerating nor decelerating. The zero net change in acceleration at those points keeps circular motion but does not add to impulse

propulsion. The remaining accelerative and decelerative ½ cycles have a common direction of accelerative influence for the space engine in the positive x direction.

A symmetry analysis also reveals that if two counter-rotational particle accelerators/ storage rings/ braking device are placed one above another, with low and high velocities found at common points on the top view circle, then equal velocities should be found at equal points throughout the both circles. This symmetry aids the mathematical determination of timing particle kicks on lower and upper accelerator doughnuts. A note need also be made that the positioning of low point velocity, and high point velocity of the particle stream need not necessarily be isolated to the intersection of the x axis. Other pairs of points may be utilized along the perimeter, that have a 180^0 relationship to each other, as high and low points of the ½ cycle relationship. This characteristic allows horizontal propulsion in any direction of the 360^0 located in the horizontal plane. In such manner, the Particle Accelerator Space Engine may also veer left, right or slow down along the plane of the horizon

Figure 12 is a depiction of a particle trajectory, for an individual particle, as the vehicle and Particle Accelerator Space Engine moves through space, and time. Let us say that a circular accelerator is the means of propulsion for a space craft. From the viewpoint of a passenger, the particle flow is along a stationary path around them. To a person on the ground the particle path follows a scribble pattern as the accelerator moves in a forward direction.